

# Enhanced Delta Smelt Monitoring

## Preliminary Abundance Analysis

### DRAFT

U.S. Fish and Wildlife Service

February 3, 2017

This analysis is preliminary and the results are subject to correction and revision. The following points should be taken into consideration when interpreting the results:

1. Delta smelt caught in the wings of the net (as opposed to the live box or cod end) were excluded from this analysis. Fish caught in the wings are indicated by a Gear Condition Code of 9.
2. Abundance estimates labeled **Total** exclude any strata that were not sampled in a given week.
3. The **Week** designations used here were defined out of convenience and are subject to change.

#### Update Log

January 14, 2017

- Different abundance estimation methods were applied to Weeks 1 – 3 and Week 4 because of model convergence issues.

January 20, 2017

- A new optimization method was used to estimate abundance estimates and overcome the issues in the last report. The updated method was applied to Weeks 1 - 5 and resulted in changes to past abundance estimates, particularly in Week 4. The updated method will be used in future reports unless otherwise noted.

January 27, 2017

- The method used to calculate confidence intervals in Table 2 was updated.
- Maps of average delta smelt catch densities by site were added.
- An abundance time series figure was added.
- An update log was added to reflect major changes made to this report between weeks.

February 3, 2017

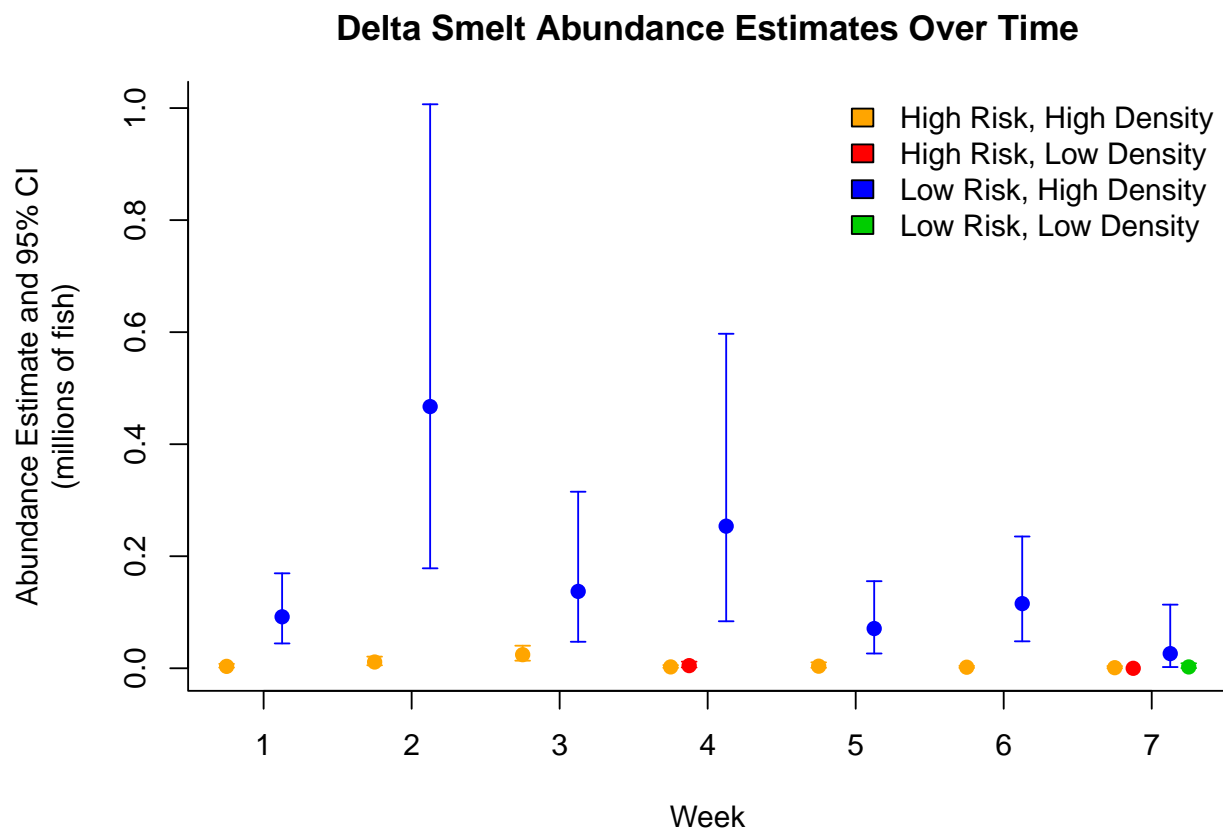
- Sampling was cut short by fog and high winds, resulting in fewer sites in the "High Risk, Low Density" stratum than originally scheduled.

Table 1: Abundance estimates by week. \*No delta smelt were caught.

Week	Dates	Stratum	NumOfSites	Estimate and 95% CI		
				Abundance	Lower Bound	Upper Bound
1	Dec 15 - Dec 22	High Risk, High Density	12	3,446	1,200	7,861
		High Risk, Low Density	0	NA	NA	NA
		Low Risk, High Density	11	91,923	44,348	169,498
		Low Risk, Low Density	0	NA	NA	NA
		Total	23	95,369	47,213	172,672
2	Dec 27 - Dec 29	High Risk, High Density	10	11,243	5,403	20,787
		High Risk, Low Density	0	NA	NA	NA
		Low Risk, High Density	6	467,217	178,440	1,006,770
		Low Risk, Low Density	0	NA	NA	NA
		Total	16	478,459	186,891	1,016,359
3	Dec 30 - Jan 5	High Risk, High Density	15	24,346	13,617	40,316
		High Risk, Low Density	0	NA	NA	NA
		Low Risk, High Density	9	137,290	47,331	315,165
		Low Risk, Low Density	0	NA	NA	NA
		Total	24	161,636	65,121	336,584
4	Jan 6 - Jan 12	High Risk, High Density	11	2,495	884	5,633
		High Risk, Low Density	6	4,782	1,447	11,849
		Low Risk, High Density	3	253,743	83,929	597,118
		Low Risk, Low Density	0	NA	NA	NA
		Total	20	261,020	88,981	603,276
5	Jan 17 - Jan 19	High Risk, High Density	8	3,788	919	10,581
		High Risk, Low Density	0	NA	NA	NA
		Low Risk, High Density	8	70,983	26,418	155,463
		Low Risk, Low Density	0	NA	NA	NA
		Total	16	74,771	29,175	158,938
6	Jan 23 - Jan 26	High Risk, High Density	11	1,947	732	4,237
		High Risk, Low Density	0	NA	NA	NA
		Low Risk, High Density	12	115,465	48,101	235,249
		Low Risk, Low Density	0	NA	NA	NA
		Total	23	117,411	49,627	236,938
7	Jan 30 - Feb 2	High Risk, High Density	6	1,090	153	3,921
		High Risk, Low Density	2	0*	NA	NA
		Low Risk, High Density	6	26,244	2,208	113,571
		Low Risk, Low Density	8	2,452	339	8,865
		Total	22	29,786	3,144	119,333

Table 2: Proportion of delta smelt in high density areas that are also in high risk areas. Weeks with sampling outside of the high density areas may be omitted to avoid confusion.

Week	Estimate and 95% CI		
	Proportion	Lower Bound	Upper Bound
1	0.036	0.012	0.106
2	0.023	0.008	0.067
3	0.151	0.056	0.346
5	0.051	0.012	0.194
6	0.017	0.005	0.052



**Week 1 (12/15/16 – 12/22/16)**

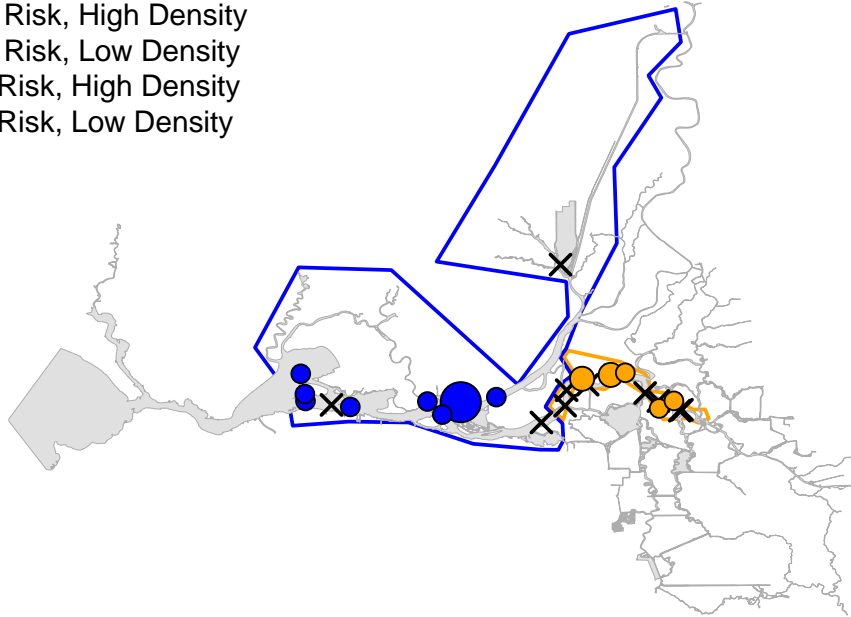
23 sites; 19 Delta Smelt total

**Delta Smelt Total Catch by Site**

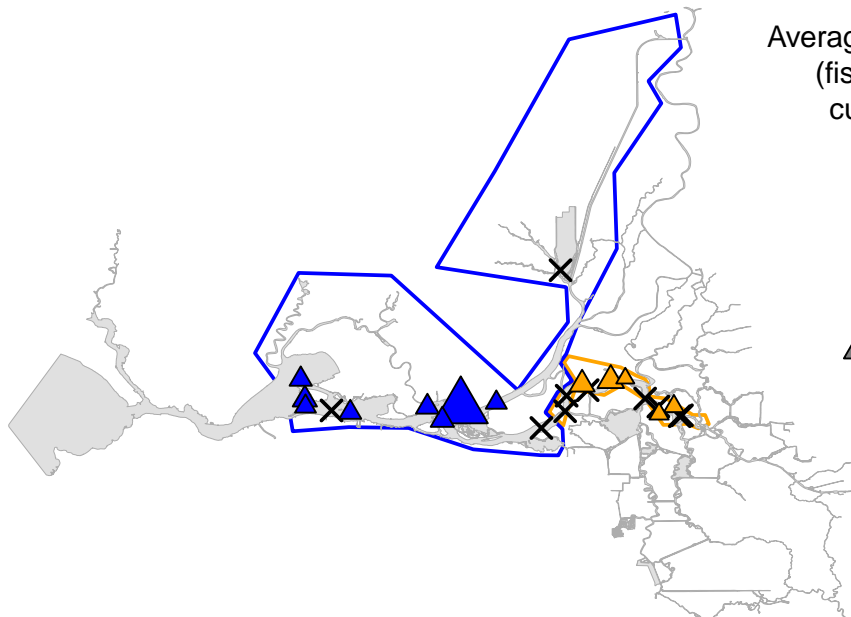
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

**Total Catch**

- × 0
- 1
- 3
- 5

**Delta Smelt Average Catch Density by Site****Average Catch Density**  
(fish per 10,000 cubic meters)

- × 0
- ▲ 0.4
- ▲ 5.2
- ▲ 10.1



**Week 2 (12/27/16 – 12/29/16)**

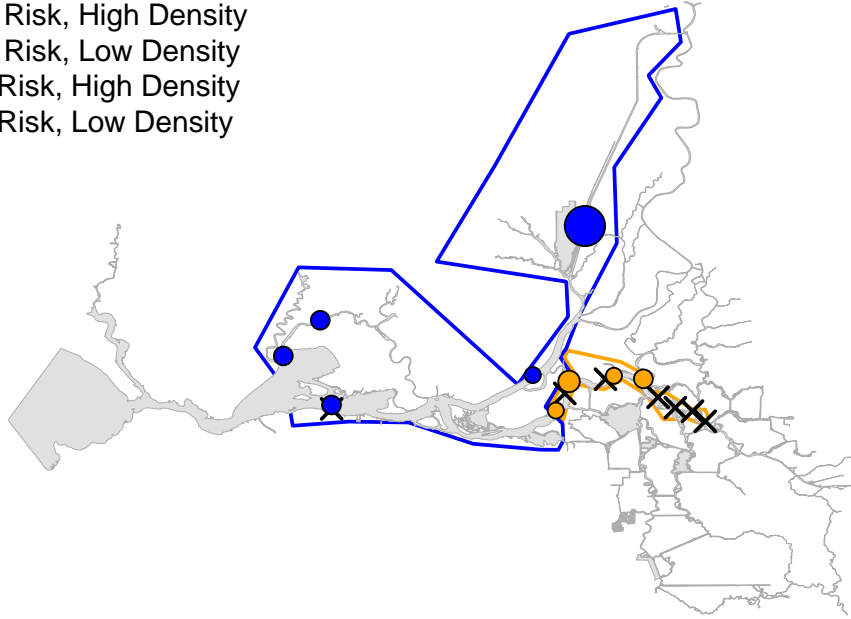
16 sites; 24 Delta Smelt total

**Delta Smelt Total Catch by Site**

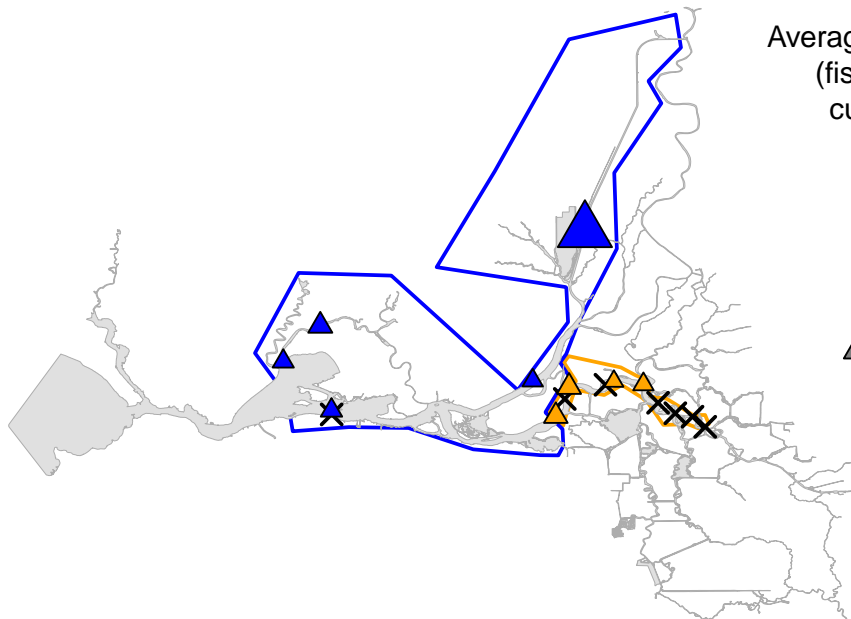
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

Total Catch

- × 0
- 1
- 6
- 10

**Delta Smelt Average Catch Density by Site**Average Catch Density  
(fish per 10,000  
cubic meters)

- × 0
- ▲ 1
- ▲ 18.4
- ▲ 35.8



**Week 3 (12/30/16 – 1/5/17)**

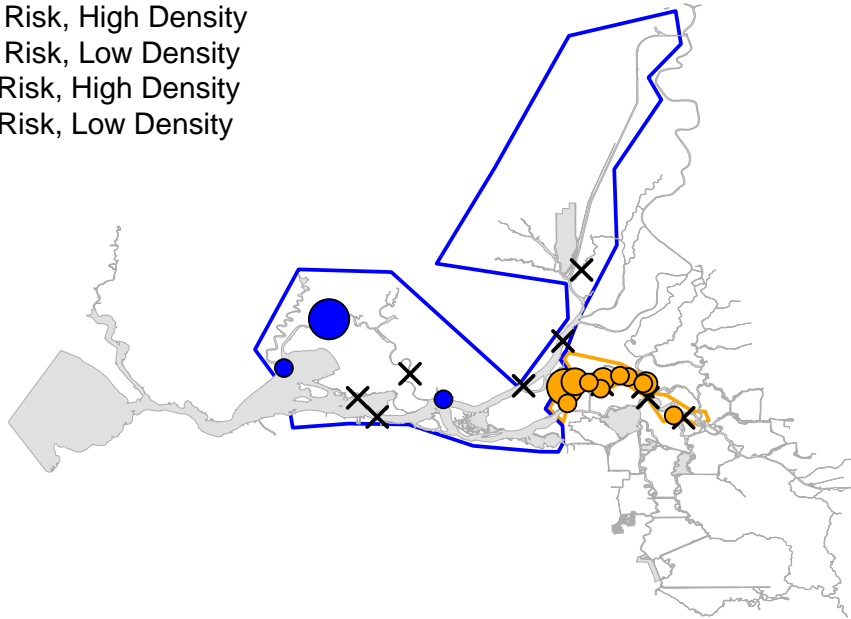
24 sites; 27 Delta Smelt total

**Delta Smelt Total Catch by Site**

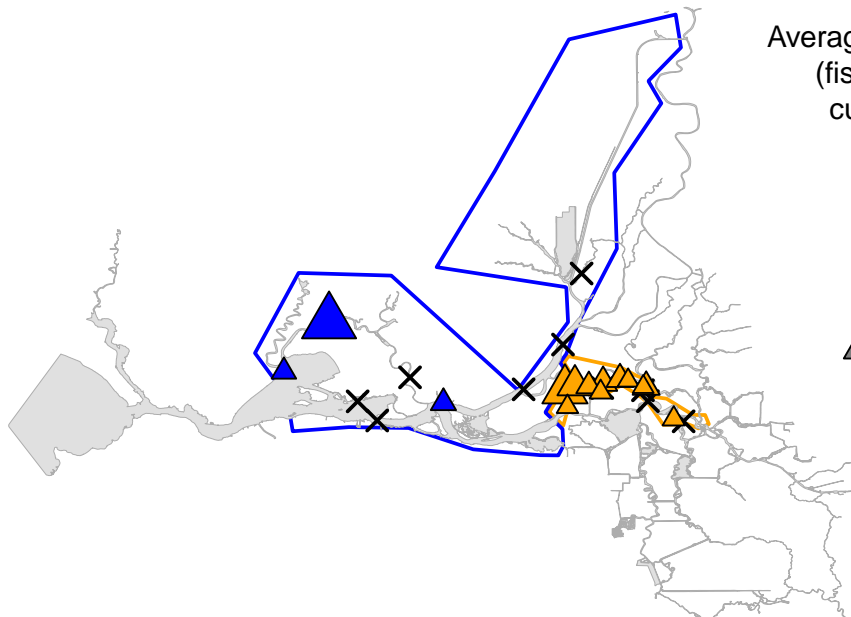
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

**Total Catch**

- × 0
- 1
- 4
- 6

**Delta Smelt Average Catch Density by Site****Average Catch Density  
(fish per 10,000  
cubic meters)**

- × 0
- ▲ 1
- ▲ 7
- ▲ 13.1



**Week 4 (1/6/17 – 1/12/17)**

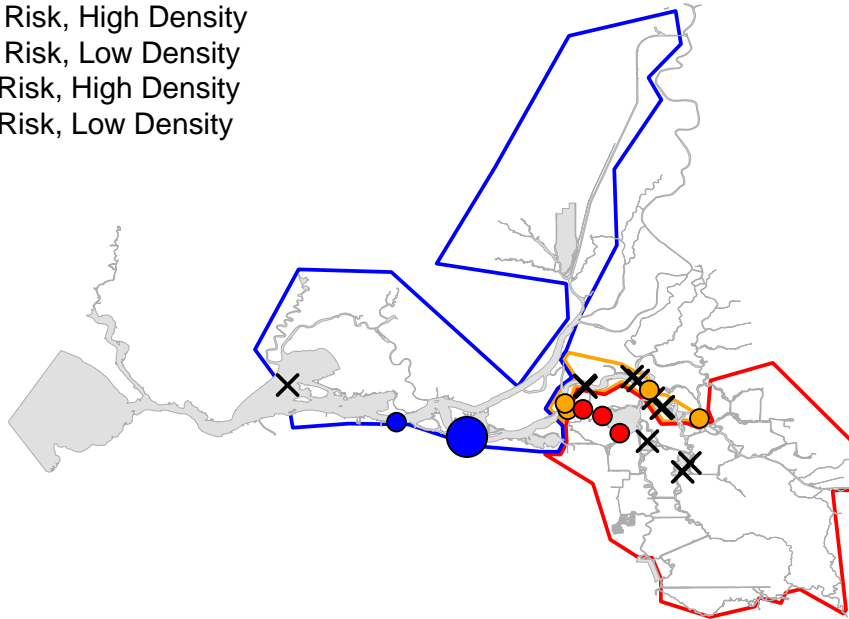
20 sites; 13 Delta Smelt total

**Delta Smelt Total Catch by Site**

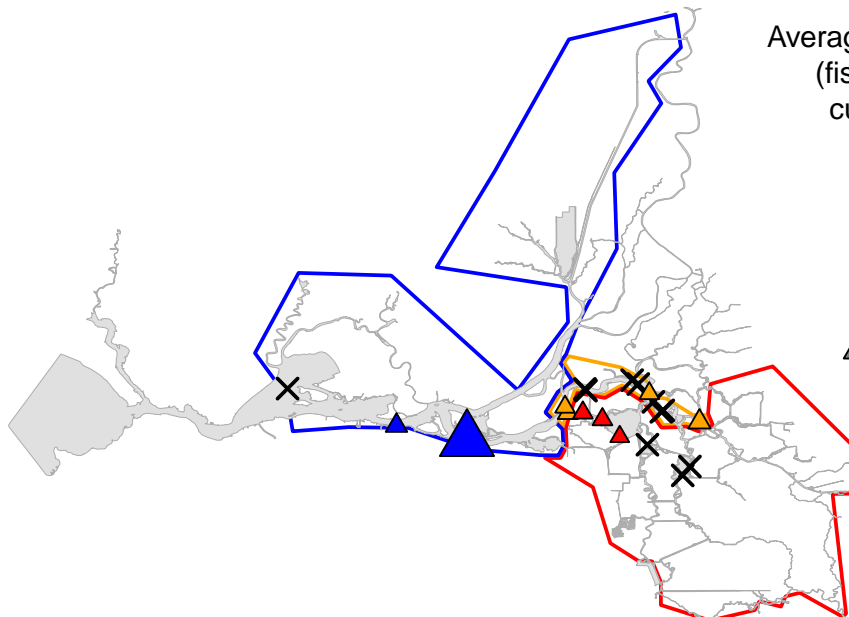
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

Total Catch

- × 0
- 1
- 3
- 5

**Delta Smelt Average Catch Density by Site**Average Catch Density  
(fish per 10,000  
cubic meters)

- × 0
- ▲ 0.3
- ▲ 6.8
- ▲ 13.4



**Week 5 (1/17/17 – 1/19/17)**

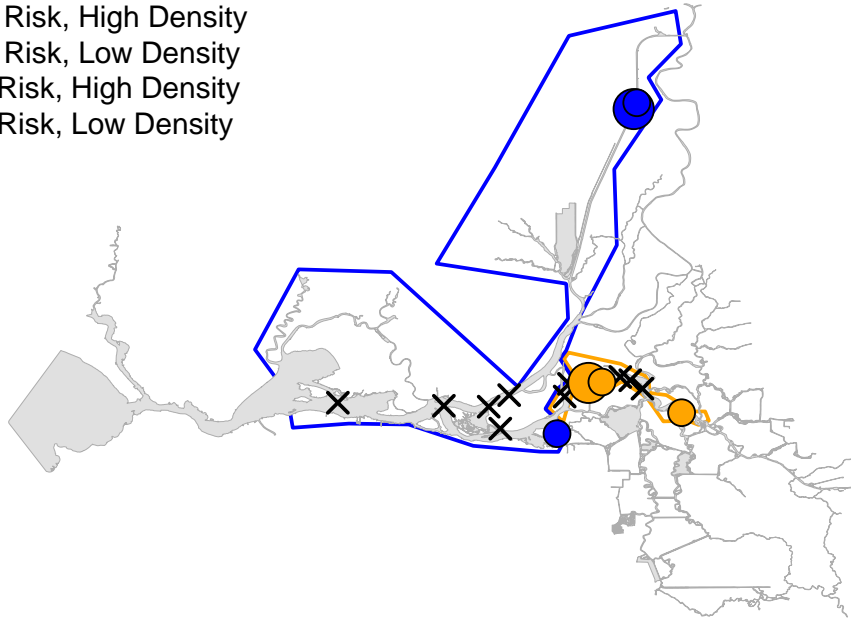
16 sites; 8 Delta Smelt total

**Delta Smelt Total Catch by Site**

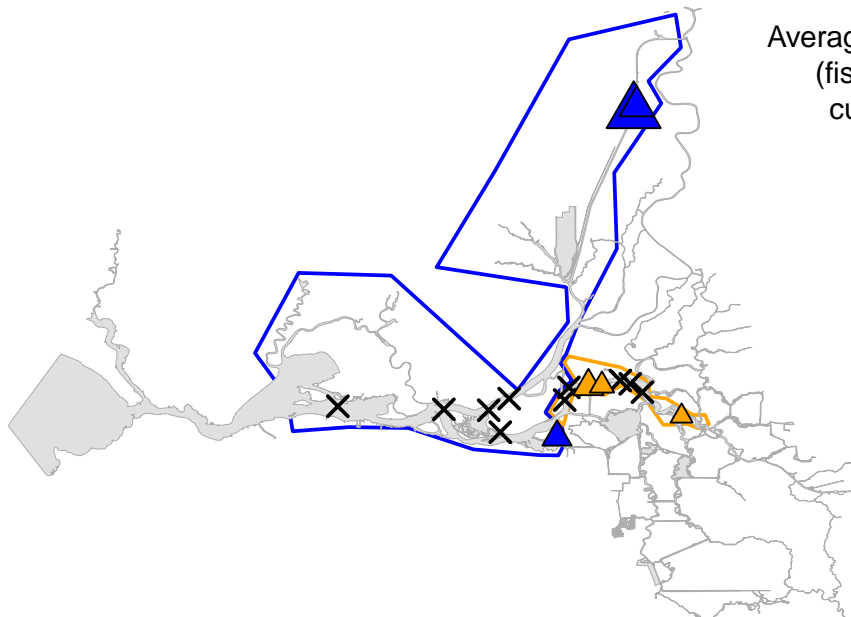
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

Total Catch

- × 0
- 1
- 2

**Delta Smelt Average Catch Density by Site**Average Catch Density  
(fish per 10,000  
cubic meters)

- × 0
- ▲ 0.6
- ▲ 3
- ▲ 5.3



**Week 6 (1/23/17 – 1/26/17)**

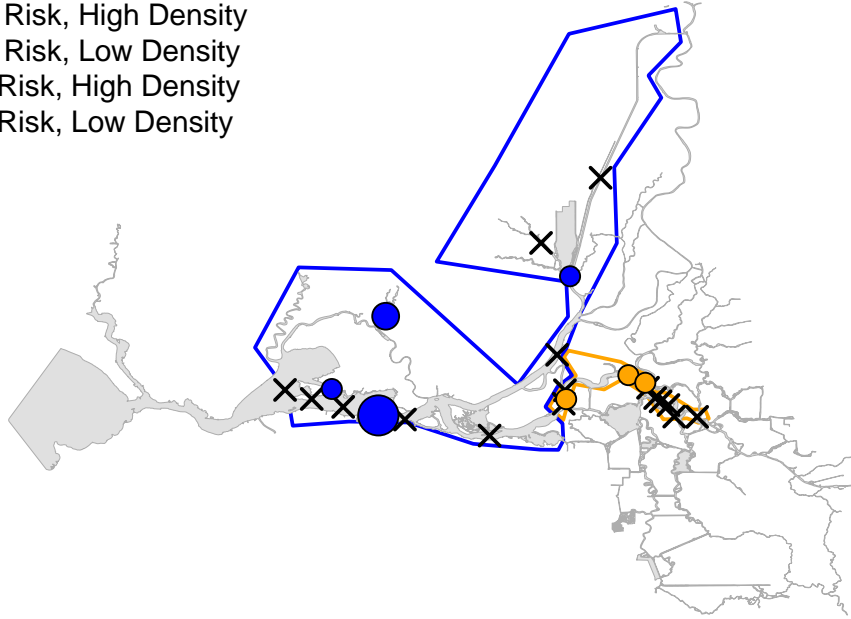
23 sites; 11 Delta Smelt total

**Delta Smelt Total Catch by Site**

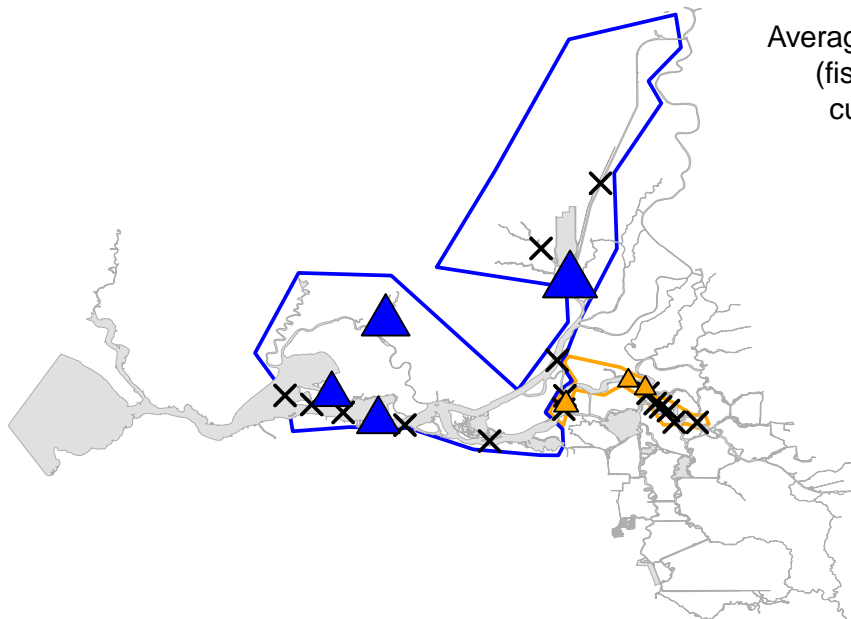
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

**Total Catch**

- × 0
- 1
- 2
- 4

**Delta Smelt Average Catch Density by Site****Average Catch Density  
(fish per 10,000  
cubic meters)**

- × 0
- ▲ 0.5
- ▲ 3.8
- ▲ 7.1



**Week 7 (1/30/17 – 2/2/17)**

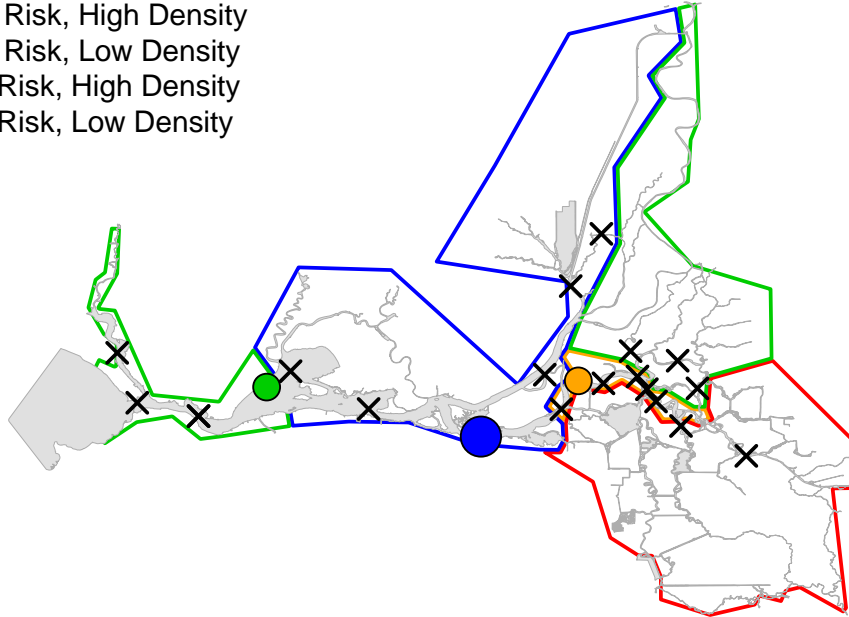
22 sites; 4 Delta Smelt total

**Delta Smelt Total Catch by Site**

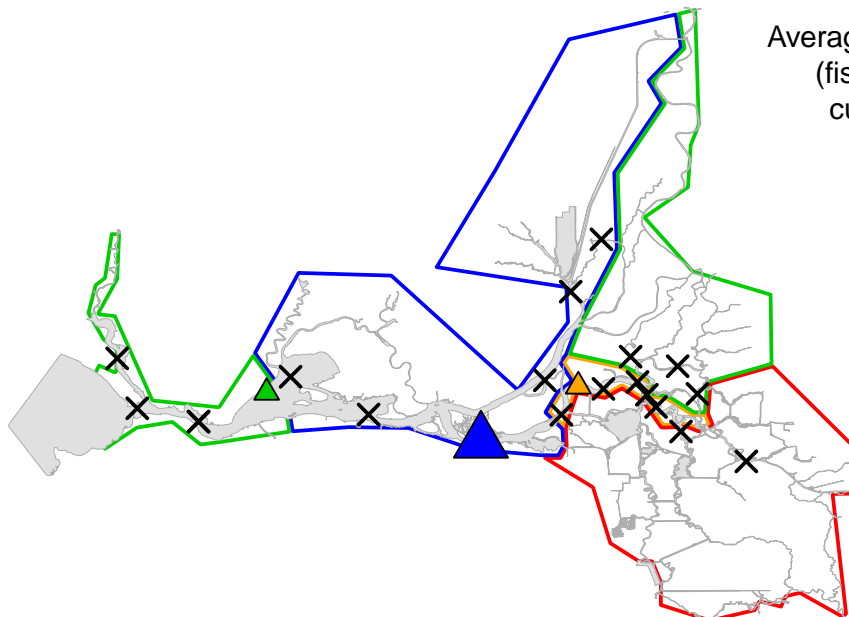
- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

Total Catch

- × 0
- 1
- 2

**Delta Smelt Average Catch Density by Site**Average Catch Density  
(fish per 10,000  
cubic meters)

- × 0
- ▲ 1
- ▲ 3.1
- ▲ 5.2



### All Sampling Locations To Date

- High Risk, High Density
- High Risk, Low Density
- Low Risk, High Density
- Low Risk, Low Density

